*Practical Proofs of Chemical Laws: a Course of Experiments upon the Combining Proportions of the Chemical Elements.* By Vaughan Cornish, M.Sc. (London: Longmans, Green, and Co., 1895.)

THIS small work is essentially a product of the modern efforts to teach science by a scientific method.

The author has endeavoured to give, in some ninety-two pages, clear and sufficient instructions for the experimental verification of the great quantitative laws upon which chemistry is based, and he has fully succeeded.

Nothing could be better calculated to lend interest to the work than the author's plan of quoting the results which were considered sufficient to establish these laws in the early days of our science; and the comparison of experimental data, obtained by the student, with the classical results of the great pioneers of chemistry, must lend a reality and zest to his efforts.

Used in its proper place, with students who have been well trained in general experimental science, and under the supervision of a capable teacher, there is no reason to suppose that the somewhat dogmatic statement of chemical laws will have any ill result.

The statement of the law of constant proportion given on p. 3—"this proportion remains constant in compounds which contain also other elements"—is so worded as to convey a wrong impression. It might be thought, for instance, that the proportion obtaining between potassium and chlorine in potassium chloride would remain the same in potassium chloroplatinate, which contains also another element platinum, and a reference to chapter v. would confirm this impression. It is evident that this statement requires remodelling.

Certain slips of a different type have found their way into the text. Thus, "*hollow glass-rod*" is mentioned on p. 52; and on p. 62, it is advised to treat silver with "pure strong hydrochloric acid" in order to convert it into silver chloride. Notwithstanding these minor defects, the book may be safely commended as embodying a well-thought-out and feasible plan of work. T.

*Great Astronomers.* By Sir Robert S. Ball, F.R.S. Pp. 372. (London: Isbister and Co., 1895.)

THE greater part of this book consists of *réchauffées* articles from *Good Words* and other publications. At the present day there is a large public curious to know biographical details, so no doubt the book will find many appreciative readers. The astronomers whose lives are portrayed are Ptolemy, Copernicus, Tycho Brahe, Galileo, Kepler, Newton, Flamsteed, Halley, Bradley, William and John Herschel, Laplace, Brinkley, the Earl of Rosse, Airy, Hamilton, Le Verrier, and Adams. It need hardly be said that the serious student of astronomy will find little in this book not already familiar to him; the volume is intended for the popular mind, and therefore much of it is small talk of the kind in which the general public revels. When the lives of eighteen astronomers are described in a volume of less than four hundred pages, as they are in this book, it is needless to say that only a few of the features characteristic of each can be presented. Sir Robert Ball has, however, selected the chief features in the lives and works of the great men who form his subjects, and his sketches, though verbose in parts, bring to light a few new facts in which astronomers generally will be interested. The book contains numerous illustrations, many of them new. The illustrations chiefly represent the astronomers described, and their houses, observatories, and instruments. We cannot understand, however, why some of them are in the book at all; for instance, with the sketch of the Earl of Rosse we find pictures of Birr Castle; The Mall, Parsonstown; and the Roman Catholic Church at Parsonstown. The connection of these views with "Great Astronomers" is much less reasonable than that between cats and clover.

## LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

### Sir Robert Ball and "The Cause of an Ice Age."

I SHOULD like to correct one statement in my long letter in NATURE of October 17. I there said that Sir Robert Ball had not withdrawn his claim to the discovery of the law of distribution of summer and winter temperature in each hemisphere, which had in fact been previously published by Wiener. I am reminded by Mr. Kendall that I had overlooked a second edition of the book in which credit is duly assigned to Wiener. Thereby hangs a tale. I have looked in vain through Low's well-known list for any trace of a second edition. I also looked through the British Museum Catalogue without any result, and inquired in the Copyright Office in that establishment, and was told that no such book had reached the Museum. Lastly, the Museum people tell me they have applied to the publisher for the book, and have received the reply that it is only a re-issue, and not a new edition with new matter in it.

I am further told by the Museum officials, that he has thereby incurred a penalty of £5 for non-compliance with the Copyright Act. It was by an oversight of his, therefore, that this second edition has been overlooked by myself and, probably, by others.

In this second edition, Sir R. Ball, after unwittingly wearing the nimbus for six years, gives up his oft-repeated claim to be the discoverer of the law in question, and attributes it to Wiener. As the publication of his discovery was the alleged reason for writing the book, he had now to find another excuse, and did so by reiterating the unjust accusation he had made against Croll of having ignored the disparity between the sun-heat of summer and winter, and thus necessitating the writing of a work to set the world right on the matter.

As long ago as 1891, Mr. Noble had called attention to this injustice, and shown that Croll had nowhere made the mistake attributed to him, and quoted passages from pages 55 and 86–7 of "Climate and Time," to show that he was perfectly aware of the real conditions. Although Croll nowhere cites the actual numbers 63 and 37, or 3·93768 and 2·34550 as Wiener gives them, it is odd that in calculating the amount of sunshine received at Edinburgh in summer and winter respectively, he does give the numbers 7 to 4, that is, 63 : 36, and "Climate and Time" was published four years before Wiener's "Memoir."

It is quite true that Croll does not use these figures in his calculations as Dr. Ball does. For him they would be mere academic numbers, since he knew, as we know, that the problem to be solved depends much on the proportions of the differential temperature of different latitudes at different seasons, and little or nothing on the proportions of the temperatures at different seasons of a whole hemisphere lumped together.

Since the above was written, Mr. Hobson has replied to my previous note, complaining that I have converged attention upon the now famous law, which was supposed to be Sir R. Ball's own child, and have not referred to the effects of varying eccentricity, which were everybody's property. He forgets that I was criticising Dr. Ball, who habitually claims the law in question as the *causa causans* of an Ice age, and especially refers to this invariable and constant factor as "the following theorem which constitutes *the essence of the astronomical theory of an Ice age.*"

The value of this essential factor of the problem being the matter in dispute, I presume Mr. Hobson wrote his letter to illuminate your readers, and not merely to engage in a profitless polemic. If so, perhaps he will do me the favour of meeting the following case.

(1) Wiener's law is not disputed. It represents the proportions between the *sum* of all the sun-heat received in either hemisphere in summer and winter respectively.

(2) Sir R. Ball makes it apply not only to the whole hemisphere, but to different zones in the hemisphere, and notably to Britain (see "A Cause for an Ice Age," new edition, pp. 127–131). Will Mr. Hobson support this astounding conclusion?

(3) In the zone between the tropics there is perpetual summer, and it absorbs one-half of the sun's heat received on the earth in equal proportions in the two seasons. Here, therefore, the proportions of sun-heat are not 63 : 37, but 50 : 50. There-

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fore Wiener's law is not true of this zone taken apart. If we subtract the sun-heat received in this zone where glacial conditions never existed, we shall find that the proportions in the temperate and polar zones combined are not 63 to 37, but 38 to 12. So that Wiener's law is not true of these zones where glacial conditions alone existed. If, instead of taking the tropics, we take the area limited by the parallels of 45°, which is a better boundary for the district displaying glacial phenomena, the disparity is still greater. At Edinburgh, as Croll long ago said, the proportions are about 3 to 1. Does Mr. Hobson dispute this?

(4) Dr. Ball nowhere connects Wiener's law as a cause with the Glacial age as an effect *by proof of any kind*. He merely offers us certain *obiter dicta*, and argues that if the present proportions of sun-heat were distributed over a winter of 199 days and a summer of 166 days, we should have a glacial climate in Britain. Since the proportions of sun-heat actually recorded in Britain at this moment in our 199 coldest and 166 warmest days respectively show a far greater disparity than that represented by these figures, I may, I think, ask if Mr. Hobson admits this *reductio ad absurdum* of Sir Robert Ball's argument to be valid?

(5) Lastly. For the first time, Mr. Culverwell has applied numerical tests and methods to the problem of discovering the actual and not the hypothetical results on climate caused by a varying eccentricity of the earth's orbit. He has done so by comparing the actual sun-heat received by each latitude now, and contrasting it with the actual sun-heat received by the same latitude in the time of greatest eccentricity, and has shown that the limits of variation do not amount to more than can be measured by removing a parallel of latitude from 3½ to 4 degrees. This to some of us is absolutely conclusive, not only against Dr. Ball's arguments, but against all astronomical theories, including Croll's.

The real point and meaning of my letters is that in regard to the astronomical theory of an Ice age all the kind of reasoning employed by Sir R. Ball and its consequences are fallacious. They have been swept away and shown to be worthless by Mr. Culverwell's method of solving the problem, which is inductive and decisive, and which rigorously proves that Sir Robert Ball's results are as extravagantly baseless as his method is unfruitful. This being so, it is most clearly incumbent upon the Lowndean Professor either to answer his accomplished critic or to withdraw his book, which is only misleading the unwary by having its mistaken and shattered arguments sheltered under the Astronomical Chair at Cambridge. It ought certainly to have no place in a series entitled "Modern Science," where ascertained results and not ingenious fallacies ought to find a place. Nor ought Mr. Kegan Paul's name to appear on its title-page as a guarantee of its scientific soundness.

The Athenæum Club, October 29. HENRY H. HOWORTH.

## Curious Aerial or Subterranean Sounds.

PROF. G. H. DARWIN, in NATURE for October 31, p. 650, asks for information as to the "Barisàl guns." The name is derived from Barisàl or Burrisal, a town in the eastern part of the Gangetic delta, and the best and most recent account of the sounds known as the "Barisàl guns" is to be found in the report of a sub-committee of the Asiatic Society of Bengal, published in the *Proceedings* of that Society for 1889, p. 199.

The great difficulty in the way of accepting the suggestions of Messrs. Meldola and Davison (NATURE, November 7, p. 4), that earthquake shocks are the cause of the sounds, is the restriction of the "Barisàl Guns," so far as is known, to a comparatively small area, where earthquakes are of rare occurrence, and to a particular season of the year.

W. T. BLANFORD.

[*Translated by Prof. G. H. Darwin.*]

AN article, by Prof. G. H. Darwin, on "Barisàl Guns and Mistpouffers" appeared in NATURE for October 31. Summarising a letter in which I drew his attention to this phenomenon, he mentions two sources for these mysterious sounds, which my friend M. Rutot and I have considered as possible, namely that the origin is entirely terrestrial, or that it is a special phenomenon of atmospheric electricity. It is as well, perhaps, also to point out another purely atmospheric source, viz. that it may arise from the abrupt displacement of a mass of superheated air in unstable equilibrium, which rises suddenly in the atmosphere.

This was the explanation given to M. Lancaster by the late M. Houzeau, the astronomer, on the former sending him my first notes on this phenomenon, in about 1881. M. Houzeau also stated that he had himself observed the noises, but that he could not suggest any more plausible explanation than the above.

In confirmation of this hypothesis, I would remark that *this year* the mysterious detonations were heard up to the end of September, and even up to the beginning of October, not only by me but by several of my friends and correspondents; this is much later in the year than usual. Now great and unusual heat prevailed this year during the whole autumn, and this coincidence affords a strong support to the theory of an origin arising from certain conditions of rise of temperature.

Sailors of the port of Ostend assert that "Mistpouffers" prevail over the whole of the North Sea as far as Iceland, and they consider them to be a sign of fine weather, with calms and heat.

The mysterious noises, mentioned to me by Mr. Clement Reid, which are heard on Dartmoor and in Scotland near the Highland Fault, are not perhaps exactly comparable with "Mistpouffers"; for Mr. Reid writes to me that these sounds are probably associated with those incessant tremors of the earth's crust, which are well known in these districts. With respect to sounds of this peculiar kind, readers of NATURE will find an interesting note by Mr. Charles Davison, entitled "On Earthquake Sounds," in the *Geological Magazine* for May 1892.

I might add many interesting data concerning "Mistpouffers," but I have promised to reserve them for the Belgian magazine *Ciel et Terre*, edited by M. Lancaster. In that journal, the readers of NATURE who are interested in this subject, will shortly find a complete account of the papers which have come to my knowledge; to which they will doubtless be able to add a number of facts and observations, which will prove of great service for the scientific study of the question.

ERNEST VAN DEN BROECK.

39 Place de l'Industrie, Brussels.

I HAVE heard many queer noises in lonely spots, and wish I had made note of the time and place and circumstances. But though I have few exact facts and figures, I have a very distinct recollection of many such observations, some of which are a direct answer to the question asked by Prof. Darwin in your number of October 31, while others seem to have a bearing upon it.

I have sometimes heard on the mountains north of the great Craven Faults, from which I looked over low ground towards Morecambe Bay, what I always took to be the sound of heavy guns somewhere out seaward. They were not, however, repeated at such intervals, nor for so long a time as to support the view that it was the sound of artillery practice; and, when I made inquiries from friends who resided in the district, I never learned that there was anything of the sort going on. The sound struck me as peculiar, but I could not find any satisfactory explanation of it. I considered many possibilities. First, there was the general question of the different transmission of such sounds according to the state of the atmosphere. Fog, for instance, affects it. In the particular case I have mentioned, I knew there were great quarries in various places within a few miles, and I had always before me the possibility of my having heard the sound of blasting echoed by some combination of cliffs to where I was.

The noises I heard were just such as are produced by the thud of the wave as it fills a cave. The muffled sound of the impact of water is heard a long way off. An idea of its force may be gained from cases in which the air, instead of being compressed in the hollow of the rock, finds an opening to the surface of the ground above, and rushes out, sometimes followed by a spout of spray. Its recurrence is irregular, and it lasts only for the short time when the rise and fall of the waves just fills and empties the cave. The direction of the transmission of this sound to long distances is still more uncertain.

In the case of the air-thuds on the Yorkshire Fells this explanation is extremely improbable, and the "guns of Barisàl," so named from the town and river of that name, boom across the flat delta of the Ganges, where there can be no cliffs or caves. What is really common to the two areas suggests another possible explanation.

The sound of the first blow of the curled wave upon the shore or on the sea, and of the outburst of the great volume of air included in its fold, is carried an immense distance. I have heard it much resemble heavy guns. It is exceptional and irregularly intermittent. It is only when the tide has reached one part of

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